SYLLABUS

1. Data about the program of study

1.1	Institution	Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Electrical Engineering
1.3	Department	Electrotechnics and Measurements
1.4	Field of study	Electrical Engineering
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/ Qualification	Electrical System/ Engineering
1.7	Form of education	Full time
1.8	Subject code	4

2. Data about the subject

2.1	Subject name			Physics I		
2.2	Course responsible/ lecturer			L.dr.Eng. Boşca Maria – Maria.Bosca@phys.utcluj.ro		
2.3	Teachers in charge of Seminars/ Laboratory/ Project			L.dr.Eng. Boşca Maria – Maria.Bosca@phys.utcluj.ro		
2.4 Year of study	I	2.5 Semester	I	2.6 Type of assessment *(E – exam, C – colloquium, V – verification)*	E	
2.7 Subject category	*DF – fundamental, DD – in the field, DS – specialty, DC – complementary*				DF	
	DI – compulsory, DO – elective, Dfac – optional				DI	

3. Estimated total time

3.1 Number of hours per week:	3	of which	3.2 Course	2	3.3 Seminar	-	3.3 Laboratory	2	3.3 Project	
3.2 Total hours per semester	56	of which	3.5 Course	28	3.6 Seminar	-	3.6 Laboratory	28	3.6 Project	

3.7 Semestrial time distribution:	
(a) Guidebook, course documentation, notes and bibliography study	18
(b) Supplementary study in the library, online and in the field specialty documentation	10
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays	14
(d) Tutoring	-
(e) Exams and tests	2
(f) Other activities	
3.8 Total hours of individual study *[sum (3.7(a) to 3.7(f))]*	44
3.9 Total hours per semester *[sum of 3.4 and 3.8]*	100
3.10 Number of credit points	4

4. Prerequisites (where applicable)

4.1	Curriculum	Basic background knowledge in Physics from High school
4.2	Competences	Elements of differential and integral calculation

5. Requirements (where appropriate)

5.1	For the course	Amphitheatre, Technical University of Cluj-Napoca
5.2	For the applications	The presence at the seminaries is compulsory.

6. Specific competences

Professional Competences	- Definition of the main physical quantities and their measurement units. - The use of integral and differential calculus for the description of physical phenomena. - Acquiring the concepts of energy, energy conservation, efficiency. - Acquiring the notions of oscillations and waves (mechanical, electromagnetic). - Acquiring the notion of field (gravitational, electric, magnetic, electromagnetic). - The dual nature of matter in the universe (wave-body dualism). - Photons and waves attached to microparticles. - Fundamentals of Quantum Physics. - The structure of atoms and molecules. - Energy structure of solids. - The main properties (electrical and magnetic) of solids.
Cross competences	- Identify physical phenomena and explain them. - Identify the components of a laboratory installation and explain its operation based on the laboratory report. - To measure with different measuring instruments. - Process the experimental results and determine other physical quantities based on them. - To graphically represent experimental results and obtain information from graphical representations. - To estimate the errors that affect the data obtained through measurements or those determined based on experimental results. - To solve problems related to the studied physical phenomena.

7. Discipline objectives (based on specific competencies acquired)

7.1	General objective	The development of theoretical knowledge and experimental skills in the field of Newtonian mechanics, thermodynamics, fluid mechanics and electricity. Using integral and differential calculus to describe physical models.
7.2	Specific objectives	1. Assimilation by students of the quantities and laws that govern the fundamental physical phenomena for the purpose of the intellectual training of the future engineer. 2. Initiating future engineers in the development and use of physical models, as a practical way of extracting the essential from a complex set of empirical phenomena. 3. Training the skills to quantitatively approach complex problems through exercises applying the fundamental laws of physics.

8. Contents

8.1. Course (Lectures)	Number of hours	Teaching methods	Additional remarks
Course 1. Physical quantities and units of measure. Operations with vectors.	2 hours	Systematic exposition of	
Course 2. Material point mechanics. Cinematics. The fundamental principles of mechanics. Conservation laws in mechanics.	2 hours		
Course 3. Harmonic oscillations. Composition of parallel and perpendicular harmonic oscillations.	2 hours		

	Course 4. Damped and maintained oscillations. Resonance phenomena.	2 hours	physical phenomena, conversations, theoretical and experimental demonstrations, observations and analysis of studied phenomena, learning through discovery.	Exposure and free discussions. Computer, video projector, blackboard.
	Course 5. Elastic waves. Waves diffraction. Elastic waves reflex and refraction. Waves interference. Stationary waves.	2 hours		
	Course 6. Acoustic elements. The Doppler effect.	2 hours		
	Course 7. Thermodynamics - principles. Simple transformations of ideal gases. Polytropic transformations. Thermal machine. Carnot cycle.	2 hours		
	Course 8. Course 8 - Electric charge. Coulomb's law. The electric field. The intensity of the electric field. Electrical charge distributions. Mechanical work and potential in an electric field. The electric dipole.	2 hours		
	Course 9. Electric field flow. Gauss's law for the electric field. Applications of Gauss's Law. Gauss's law in dielectrics. The electric capacitor.	2 hours		
	Course 10. Electric current. The intensity of the electric current. Current density. Classical theory of electrical conduction in metals. Ohm's law. Direct current circuits. Energy and electrical power.	2 hours		
	Course 11. The magnetic field. Lorentz force. The electromagnetic force. Current loop in uniform magnetic field. Sources of the magnetic field. Biot-Savart's law. Ampere's law. The interaction force between two parallel conductors.	2 hours		
	Course 12. Law of electromagnetic induction (Faraday's law). The phenomenon of self-induction. Maxwell's equations. Electromagnetic waves. Propagation of electromagnetic waves.	2 hours		
	Course 13. Elements of geometric optics. The plane diopter. Spherical diopter. The plane mirror. Spherical mirror. Thin lenses.	2 hours		
	Course 14. Thermoelectric and galvano-magnetic effects. Seebeck effect. Thomson effect. The Peltier effect. Hall effect.	2 hours		

Bibliography

1. H. D. Young, R. A. Freedman - Sears and Zemansky's University Physics with Modern Physics Technology Update (lb. engleza), Pearson - 2013.
2. D. Halliday, R. Resnik, Physics, John Willey et sons (any edition)
3. http://hyperphysics.phy-astr.gsu.edu
4. Lidia Pop, Maria Boşca, Noţiuni de fizică mecanică, Editura UTPress, 2012
5. E.Culea, Fizica – elemente de fizica pentru ingineri, Risoprint, 2010

8.2. Applications - Seminar /Laboratory/Project		Number of hours	Teaching methods	Additional remarks
	Laboratory 1. Introduction. Labor protection. List of works. Calculation of errors. Graphical representation.	2 hours		

	Laboratory 2. Determination of the elastic constant of a spring.	2 hours	Theoretical and experimental demonstration, conversation, observation, and analysis.	Laboratory work is performed practically.
	Laboratory 3. The study of the thermoelectric effect.	2 hours		
	Laboratory 4. The study of electrical conductivity of metals.	2 hours		
	Laboratory 5. Determination of the viscosity coefficient of liquids (Stokes method).	2 hours		
	Laboratory 6. Experimental verification of the Stefan-Boltzmann law.	2 hours		
	Laboratory 7. Study of the activation energy of a semiconductor.	2 hours		
	Laboratory 8. The study of transverse standing waves in vibrating strings.	2 hours		
	Laboratory 9. The study of the photoelectric effect.	2 hours		
	Laboratory 10. Study of a spectroscope and qualitative spectral analysis.	2 hours		
	Laboratory 11. Hall effect study.	2 hours		
	Laboratory 12. The study of polarization of light.	2 hours		
	Laboratory 13. Applications.	2 hours		
	Laboratory 14. Session to cover missed lab works.	2 hours		

Bibliography

1. H. D. Young, R. A. Freedman - Sears and Zemansky's University Physics with Modern Physics Technology Update (lb. engleza), Pearson - 2013.
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5. E.Culea, Fizica – elemente de fizica pentru ingineri, Risoprint, 2010
6. https://biblioteca.utcluj.ro/files/carti-online-cu-coperta/519-0.pdf
7. Petru Păşcuţă, Lidia Pop, Maria Boşca, Fizică lucrări practice, Editura UTPress 2013

9. Alignment of course content with expectations of the epistemic community, professional associations, and representative employers in the field

The acquired skills are necessary for them and will help them to understand other disciplines, especially when they will carry out their activity in engineering fields.

10. Assessment

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade (%)
10.4 Course	Test with questions from all the taught chapters that consists of solving some problems and theory topics.	Written test (T)	80 %
10.5 Laboratory	Continuous assessment.	Written and oral (L)	20%
10.6 Minimum standard of performance: Final grade= $0.8 \cdot T + 0.2 \cdot L = 10$ - maximum grade The minimum passing grade for the exam is 5			

Date of completion	Topics	Title/ Surname/ Name:	Signature
19.09.2024	Course	L.dr.Eng. Maria Boşca	
	Applications Seminar/ Laboratory/ Project		
		L.dr.Eng. Maria Boşca	

Date of approval in the ETHM Department Council

September 2024

Head of Department:
Prof. Eng. MICU Dan Doru, PhD

Date of approval in the Faculty of Electrical Engineering Council
September 2024

Dean:
Assoc. Prof. Eng. CZIKER Andrei, PhD